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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/362,808 07/28/99 ZHANG

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EXAMINER .

020985 MM91/1105
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TRAN T

ART UNIT

PAPER NUMBER

2814

DATE MAILED:

11/05/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No. 09/362,808	Applicant(s) ZHANG, HONGYONG	
	Examiner THANH V TRAN	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 August 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 and 31-37 (newly added) ~~is~~ are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-30 and 31-37 (newly added) ~~is~~ are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- | | |
|---|--|
| 15) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 18) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 16) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 19) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 17) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 20) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3, 5 and 31-32 (newly added) are rejected under 35 U.S.C. 103(a) as being unpatentable over Fu et al. (previous applied) in view of Sasaki (U.S patent #4,404,733).

Referring to Figure 6, Fu et al. disclose a semiconductor device having a semiconductor layer 10 , a channel below polysilicon gate 14, drain 12a and source regions 12b. There is an insulating film 17 comprising silicon oxide (see column 2, line 51) formed on the semiconductor layer 10. Two interlayer insulating films 20 and 21 are comprised of silicon nitride covering the insulating film 17 . Furthermore, an opening 25 is etched through the first interlayer film 20, the second interlayer film 21 (column 1, lines 53-54) and the insulating film 17 (column 2, line 13). This opening 25, with tapered sides (column 1, line 75), shows an opening in the second interlayer insulating film 21 surrounding an opening in the first interlayer insulating film 20, and the opening

in the first interlayer insulating film 20 surrounds an opening in the insulating film 17 as shown in figure 6.

Fu et al. show the insulating film 17 comprise silicon oxide(column 3, line 31,32) as recited in claim 3, and the second interlayer insulating film 21 has a etching rate higher than the first interlayer insulating film 20.

3. Fu et al. do not disclose the edges of at least the third opening being rounded off. However, Sasaki shows forming a semiconductor devices having three insulating layers with the edges of contact holes 47 and 48 (figure 5) rounded off (column 6, lines 10-11) so that the discontinuity of the conductive layer is prevented (column 6, lines 11-12). It would have been obvious to one having ordinary skill in the art of the time the invention was made to make the edges of contact holes rounded off as taught by Sasaki in the device of Fu et al. to prevent the discontinuity of the conductive layer.

4. Claims 2,6 -18 and 33-34 (newly added) are rejected under 35 U.S.C. 103(a) as being unpatentable over Fu et al. in view of Sasaki as applied to claims 1,3 and 5 above, and further in view of Lin et al. (U.S patent # 5,8411,195)).

Fu et al. in view of Sasaki show most aspects of the instant invention (in paragraph 2), including an electrode 30 formed on the first , second and third opening and connected with one of the source and drain regions through the first, second and third openings (see figure 6). Fu et al. in view of Sasaki do not disclose a tapered angle of the second interlayer insulating film 21 (called β) with respect to a major surface the semiconductor layer 10 in the third opening is larger than a tapered angle of the first interlayer insulating film 20 (called α) with respect to a major surface of the

semiconductor layer 10 in the second opening as recited in claim 6. However, Lin et al. show in figure 7 that the second buffer layer 22 being etched faster than the first buffer layer 20. Therefore, in view of Lin et al. shown in figure 7, where it is taught that the higher etching rate of an insulating film will produce an angle larger than the angle of another insulating film that has lower etching rate. These angles are the tilt angles of the cross-sectional shape of the contact holes with respect to a major surface below. The higher etching rate of an insulating film will produce an angle larger than the angle of another insulating film that has lower etching rate. These angles are the tilt angles of the cross-sectional shape of the contact holes with respect to a major surface below. As a result, referring to figure 6 of Fu et al., the second interlayer film 21 having high etching rate, will make a taper angle of the second interlayer film larger than the taper angle of the first interlayer 20 having lower etching rate. It is obvious to a person of ordinary skill in the art that etching protocol of Fu et al. will also produce taper angles as claimed in the instant invention.

5. Claims 19-30 and 35-37(newly added) are rejected under 35 U.S.C. 103(a) as being unpatentable over Fu et al. in view of Sasaki and Lin et al. as applied to claims 2, 6-18 above, and further in view of Huang et al (previous applied).

Fu et al. in view of Sasaki and Lin et al. show most the aspects of the instant invention (paragraph 4). except for having a channel region, a low doped impurity region and high doped impurity region being adjacent to the channel region with the low doped impurity region interposed between. In figure 1, Huang teaches to use a semiconductor layer 10 having a channel region with two low doped impurity 26

region and high doped impurity region 24 such as the high doped impurity region 24 being adjacent to the channel region with the low doped impurity region 26 interposes between. A light doped region is created next to a high doped region to minimize or eliminate short channel effects, such as hot carrier effects to optimize the drive current (column 3, lines 13-14). Therefore it is obvious to a person of ordinary skill in the art at the time of invention to form the light doped drain region as taught by Huang in the device of Fu et al. in view of Sasaki and Lin et al. to eliminate the hot carrier effect.

6. Initially, with respect to claims 22,23,29 and 30, note that a "product by process" claim is directed to the product *per se*, no matter how actually made. See *In re Thorpe et al.*, 227 USPQ 964 (CAFC, 1985) and the related case law cited therein which make it clear that it is the final product *per se* which must be determined in a "product by process" claim, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. As stated in Thorpe, even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. *In re Brown*, 459 F.2d 531, 535, 173 USPQ 685, 688 (CCPA 1972); *In re Pilkington*, 411 F.2d 1345, 1348, 162 USPQ 145, 147 (CCPA 1969); *Buono v. Yankee Maid Dress Corp.*, 77 F.2d 274, 279, 26 USPQ 57, 61 (2d. Cir. 1935).

Note that Applicant has burden of proof in such cases as the above case law makes clear.

In claims 22,23,29 and 30, the dosage of dope used is an intermediate process step and does not affect the final device structure.

Response to Arguments

7. Applicant's arguments with respect to claims 1-30 and 31-37 (newly added) have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. Papers should be fax to Art Unit 2814 via the Art Unit 2814 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform with the notice published in the official Gazette, 1096 OG 30(15 November 1989). The Art Unit 2814 Fax Center number is (703) 308-7722 or -7724. The Art Unit 2824 Fax Center is to be used only for papers related to Art Unit 2814 applications.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to THANH V TRAN whose telephone number is 703-306-0208. The examiner can normally be reached on 8:00AM-5:00PM Monday through Friday or by e-mail via Thanh.Tran1@uspto.gov.

10. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306 2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703 -308-7722 for regular communications and 703 -305-3431 for After Final communications.

11. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

12. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S Class/Subclass(es): 257/774 438/638,640	Through 10/25/01
Other Documentation: none	
Electronic Database(s): WEST(USPAT)	Through 10/25/01

Thanh Tran
October 25, 2001


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